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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,682	06/23/2003	Bernard Rafferty	E20020420	9907

7590 04/18/2005

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EXAMINER	
COOLEY, CHARLES E	

ART UNIT	PAPER NUMBER
1723	

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/601,682	RAFFERTY, BERNARD	
	Examiner	Art Unit	
	Charles E. Cooley	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-9 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 1-8 is/are allowed.

6)☒ Claim(s) 9 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 23 June 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

NON-FINAL OFFICE ACTION

1. This application has been assigned to Technology Center 1700, Art Unit 1723 and the following will apply for this application:

Please direct all written correspondence with the correct application serial number for this application to Art Unit 1723.

Telephone inquiries regarding this application should be directed to the Electronic Business Center (EBC) at http://www.uspto.gov/ebc/index.html or 1-866-217-9197 or to the Examiner at (571) 272-1139. All official facsimiles should be transmitted to (703) 872-9306.

2. As the PTO continues to move towards a fully electronic environment, the office will phase-in its E-Patent Reference program. This program: (1) provides downloading capability of the U.S. patents and U.S. patent application publications cited in Office actions via the E-Patent Reference feature of the Office's PAIR system; and (2) ceases mailing paper copies of U.S. patents and U.S. patent application publications with office actions except for citations made during the international stage of an international application under PCT.

Effective June 2004, paper copies of cited U.S. patents and U.S. patent application publications will cease to be mailed to applicants with Office actions from this Technology Center. Paper copies of foreign patents and non-patent literature will continue to be included with office actions.

The U.S. patents and patent application publications cited in office actions are available for download via the Office's PAIR system. As an alternate source, all U.S.

patents and patent application publications are available on the USPTO web site (www.uspto.gov), from the Office of Public Records and from commercial sources. Inquiries about the use of the Office's PAIR system should be referred to the Electronic Business Center (EBC) at http://www.uspto.gov/ebc/index.html or 1-866-217-9197.

Requests to restart a period for response due to a missing U.S. patent or patent application publications will not be granted.

Specification

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

4. The disclosure is objected to because of the following informalities:

a. Page 2, line 14: the status of 10/094,374 should be updated as being U.S. Patent No. 6,600,278.

Appropriate correction is required.

5. The abstract is acceptable.

6. The title is acceptable.

Claim Objections

7. Claim 9 is objected to because in line 5, replace "driver" with --drive--.

Correction is required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claim 9 is rejected under 35 U.S.C. 102(b) as being anticipated by Phillips (US 5,919,123).

The patent to Phillips '123 discloses a method for controlling a decanter centrifuge 10 seen in Figs. 1-2 in the absence of power from an AC source 62 comprising the sole claimed method step in claim 9 of providing in the absence of power from the AC source 62, power for a DC bus 54 through a variable frequency drive 50 connected to a main bowl drive motor 24 from decanter centrifuge kinetic energy.

More particularly, the patent to Phillips discloses in FIG. 1 of the drawings a centrifuge 10 the operation of which is controlled by the system, and according to the method and the computer program of the present invention. The centrifuge 10 includes an elongated bowl 12 supported for rotation about its longitudinal axis. The bowl 12 has two open ends 12a and 12b, with the open end 12a receiving a drive flange 14 which is connected to a drive shaft (not shown in FIG. 1) for rotating the bowl. A longitudinal passage extends through the drive flange 14 for receiving a feed tube 16 for introducing a feed slurry which, for the purposes of example, is a mixture of fluid and disbursed solid particles, into the interior of the bowl 12. A screw conveyor 18 extends within the bowl 12 in a coaxial relationship thereto and is supported for rotation within the bowl by

a plurality of bearings (not shown) disposed at the ends of the bowl. To this end, a hollow flanged shaft 19 is disposed in the end 12b of the bowl, extends to an external planetary gear box (not shown in FIG. 1) and receives a drive shaft 20 of the latter gear box. The drive shaft 20 transmits torque from the gearbox to rotate the screw conveyor 18 in the same direction as the bowl but at a different speed. One or more openings 18a extend through the wall of the conveyor 18 near the outlet end of the tube 16 so that the centrifugal forces generated by the rotating bowl 12 causes the slurry to gravitate radially outwardly and pass through the openings 18a and into the annular space between the conveyor and the bowl 12. The liquid portion of the slurry is displaced to the end 12b of the bowl 12 while the entrained solid particles in the slurry settle towards the inner surface of the bowl due to the G forces generated, and are scraped and displaced by the screw conveyor 18 back towards the end 12a of the bowl for discharge through a plurality of discharge ports 12c formed through the wall of the bowl 12 near its end 12a. A plurality of weirs 19a (two of which are shown) are provided through the flanged portion of the shaft 19 for discharging the separated liquid. This type of centrifuge is known in the art and, although not shown in the drawings, it is understood that the centrifuge 10 would be enclosed in a housing or casing, also in a conventional manner. Referring to FIG. 2, a drive shaft 21 forms an extension of, or is connected to, the drive flange 14 (FIG. 1) and is supported by a bearing 22. A variable speed AC main drive motor 24 has an output shaft 24a which is connected to the drive shaft 21 by a drive belt 26 and therefore rotates the bowl 12 (FIG. 1) of the centrifuge 10 at a predetermined operational speed. The flanged shaft 19 extends from the interior of the

conveyor 18 to a planetary gear box 32 and is supported by a bearing 33. A variable speed AC back drive motor 34 has an output shaft 34a which is connected to a sun wheel 35 by a drive belt 36 and the sun wheel is connected to the input of the gear box 32. Therefore the motor 34 rotates the screw conveyor 18 (FIG. 1) of the centrifuge 10 through the planetary gear box 32 which functions to establish a differential speed of the conveyor 18 with respect to the bowl 12. A torque limiting clutch 38 is provided on the shaft of the sun wheel 35, and functions in a conventional manner to control the torque applied to the gearbox 32 so that the shaft 20 (FIG. 1) of the gearbox 32 drives the conveyor 18 at a speed slightly slower than that of the rotating bowl 12. A conduit 42 is provided for receiving and containing the feed slurry being processed, and a pump 44 has an inlet connected to an end of the conduit 42 and an outlet connected to the end of a conduit 45. The conduit 45 extends into and through the drive shaft 21 and is connected to the feed tube 16 (FIG. 1). A drive unit 46, preferably in the form of an electric motor, is connected to the pump 44 for pumping the slurry from the conduit 42, through the conduit 45 and the feed tube 16 into the centrifuge 10. A valve 48 is connected in the feed tube 45 for controlling the flow of the slurry into the bowl 12. Two variable speed drive units 50 and 52 are respectively connected to the motors 24 and 34 for driving same at variable frequencies and at variable voltages as dictated by the operational requirements of the system as will be described. The drive units 50 and 52 have DC bus connections 50a and 50b, respectively, that extend to a DC bus 54. The drive unit 50 is adapted to operate on alternating current and has a converter for converting alternating current to direct current in a conventional manner, while the drive

unit 52 is adapted to operate on direct current in a manner to be described. The DC bus 54 is conventional, and, as such, includes a bank of capacitors (not shown) for receiving and storing electrical energy in a conventional manner. A fuse 56 is provided for the DC bus 54 to limit the amount of electrical energy transferred between the drives 50 and 52. A magnetic starter 58 is connected between the motor 46 and a breaker box 64 to receive power from the breaker box. The magnetic starter 58 has a magnetic contact 58a that receives a control signal in a manner to be described to control the operation of the pump 44. A computer, preferably in the form of a small logic controller ("SLC") 60, is provided which contains computer programs stored on computer-readable media and containing instructions for controlling the operation of the centrifuge 10. The SLC 60 has several input terminals, two of which are respectively connected to the drive units 50 and 52 for receiving data from the drive units, and two output terminals for respectively sending control signals to the drive units. The SLC 60 thus responds to the input signals received and controls the drive units 50 and 52 in a manner so that the drive units can continuously vary the frequency and the voltage applied to the respective AC motors 24 and 34 accordingly, to continuously vary the rotation and the torque applied to the bowl 12 and the conveyor 18, in a manner to be described. Although not shown, the SLC 60 comprises conventional devices including, but not limited to, a processor, a main memory, a mass storage device, a video display, an input device, and an audible signal generating device. A source 62 of electrical power, such as a generator, is connected to a breaker box 64 which distributes the power to the drive unit 50 and to the motor 46 through the magnetic starter 58a. The

breaker box 64 includes two breaker switches 64a which respectively limit the power applied to the drive unit 50 and the motor 46. A series of fuses, shown in general by the reference numeral 66, are connected in the line between the breaker box 64 and the drive unit 50 to limit the power transfer therebetween. An optional power sensor 68 can be connected in the line extending between the SLC and the line connecting the drive unit 50 to the breaker box, and functions to send voltage and frequency information to the SLC 60 to enable the SLC to predict power interruptions and brownouts. A barrier box 70 has an input that is connected to an output of the SLC 60 and has two outputs that are respectively connected to inputs of the SLC and to the magnetic contact 58a of the starter 58. The barrier box 70 is connected to a console 72 for providing and receiving operational and control data to and from the console. It is understood that the barrier box 70 contains intrinsic safe barriers so that the console 72 can be located in the immediate vicinity of the centrifuge. In this manner, control and data signals from the console 72 will be safe from explosive gases found in oil field environments, or the like. A power supply 74 is provided in the barrier box 70 for generating a control signal (such as twenty four volts, for example) for the SLC 60 which is utilized in the operation of the centrifuge. An uninterruptible power source 76 is provided that is connected to the power supply 74 to supply power to the power supply so that the above control signal is available to operate the system for a predetermined time after any power supplied to the breaker box 64 from the above-mentioned electrical generator has been interrupted.

In operation, the SLC 60 sends a control signal, via a relay, or the like, which, in turn, sends a pulse signal to the magnetic starter 58a which functions to start the

electric motor 46 and thus activate the pump 44. The slurry, which, for the purpose of example, will be assumed to be a mixture of fluid and entrained solid particles, is pumped from the conduit 42 and into the interior of the bowl 12 in the manner described above. The motor 24 is activated and controlled by the drive unit 50 to rotate the drive shaft 21, and therefore the bowl 12, at a predetermined speed. The motor 34 is also activated and driven by the drive unit 52 to rotate the sun wheel 35, and therefore the screw conveyor 18, through the planetary gear box 32, in the same direction as the bowl 12 and at a different speed. As a result of the rotation of the bowl 12, the centrifugal forces thus produced forces the slurry radially outwardly so that it passes through the openings 18a in the conveyor and into the annular space between the conveyor and the bowl 12. The fluid portion of the slurry is displaced to the end 12b of the bowl 12 for discharge from the weirs 19a in the flanged shaft 19, while the entrained solid particles in the slurry settle towards the inner surface of the bowl due to the G forces generated, and are scraped and displaced by the screw conveyor 18 back towards the end 12a of the bowl for discharge through the discharge ports 12c. The SLC 60 receives signals from the drive units 50 and 52 corresponding to torque and speed of the motors 24 and 34, respectively. The SLC 60 contains instructions which enables it to process the above data and control the drive units 50 and 52 based on a predetermined desired operational mode of the centrifuge 10. Thus, the drive units 50 and 52 will vary the frequency and voltage applied to the motors 24 and 34, respectively, as needed to continuously vary the rotational speed of, and the torque applied to, the drive shaft 21 and the sun wheel 35, respectively, as necessary to

maintain predetermined optimum operating conditions. In the event that a brownout occurs resulting in reduced power available from the power source 62 through the breaker box 64, the SLC 60 will detect same through its connection to the drive unit 50, and is programmed to respond accordingly. More particularly, the SLC 60 will first turn the pump 46 off by reducing the magnitude of the control signal on the magnetic contact 58a of the starter 58. Then the SLC 60 will turn off all power supplied to the drive motor 24 through the drive unit 50 to allow the motor 24 to coast momentarily and thus not consume any additional power. Under these conditions the torque applied to the conveyor 18 from the drive motor 34 and through the gear box 32 must be maintained to hold an acceptable differential rotational speed between the conveyor and the bowl 12 and to convey all of the separated solids out of the bowl. This is especially important due to the tendency of the conveyor 18 to lock to the bowl 12 in response to the coupling action caused by the solids extending therebetween. To this end, the stored energy in the capacitor bank associated with the DC bus 54 will be initially available to the drive motor 34 to continue to rotate the conveyor 18 to maintain this differential speed. However, the stored energy in the DC bus 54 will be depleted in a relatively short time. When this happens, the SLC 60 will modulate the drive motor 24 to dynamically brake, and thus decelerate the bowl 12. This creates a braking torque on the drive motor 24, and electrical energy, in the form of a variable frequency alternating current, is generated by the latter motor. This generated electrical energy is transferred to the drive unit 50 where it is converted to electrical energy having a direct current component before it is passed to the DC bus 54 via the bus connection 50a. The DC

bus 54 stores and supplies the electrical energy to the drive unit 52 to drive the motor 34. The motor 34 will thus be able to continue to rotate the conveyor 18 with sufficient torque to maintain the required relative speed differential between the conveyor and the bowl 12 sufficient to convey all solids out of the bowl 12. When the stored electrical energy builds up, the SLC 60 will deactivate the motor 24 causing the bowl to coast and thus discontinue the regeneration of electrical energy as described; and when the stored energy is depleted, the SLC will activate the motor 24 causing a regeneration of electrical energy and a transfer of same to the motor 34 via the drive units 50 and 52 and the bus 54 as described above. This cycling will continue until the bowl comes to a complete stop. If, however, the power from the source 62 is restored before the bowl looses regeneration ability, the SLC 60 will control the speed of the drive motors 24 and 34 so that they will attain their normal speed such that the fuse 56 will not be compromised until power from the source 62 is restored or until the system is shut down. If, due to this power regeneration, there is danger of exceeding the amount of power that the DC bus 54 can handle, the SLC 60 will turn on the drive motor 24 through the drive unit 50 with an acceleration ramp to consume the generated power and maintain the power applied to the DC bus 54 within acceptable limits. During this sequence, the fuse 56 in the DC bus 54 prevents excessive current transfer between the drive units 50 and 52. Therefore the SLC 60 controls the drive motors 24 and 34 in a manner to utilize the power regeneration capabilities of the system in order to keep the centrifuge 10 operating safely through a brownout, or during an emergency power loss situation. Also, the system and method of the present invention achieves these

advantages without adding to the cost of the system. Further, the system and method of the present invention is relatively inexpensive, yet is reliable and not hazardous. According to an alternate embodiment of the present invention, the drive motor 34, the drive unit 52, and the fuse 56 are eliminated and only the drive motor 24 is utilized. In this case, the SLC 60 is connected to the drive unit 50 and the drive unit 50 is connected to the drive motor 24 which is coupled to the bowl 12 and the conveyor 18 so as to drive same. Thus, as in the previous embodiment, the SLC 60 will modulate the drive motor 24 to dynamically brake, and thus decelerate the bowl 12. This creates a braking torque on the drive motor 24, and electrical energy, in the form of a variable frequency alternating current, is generated by the latter motor. This generated electrical energy is transferred to the drive unit 50 where it is converted to electrical energy having a direct current component before it is passed to the DC bus 54 via the bus connection 50a. The DC bus 54 stores and supplies the electrical energy back to the drive unit 50 to drive the motor 34. The motor 34 will thus be able to continue to rotate the conveyor 18 with sufficient torque to maintain the required relative speed differential between the conveyor and the bowl 12 sufficient to convey all solids out of the bowl 12. When the stored electrical energy builds up, the SLC 60 will deactivate the motor 24 causing the bowl to coast and thus discontinue the regeneration of electrical energy as described; and when the stored energy is depleted, the SLC will activate the motor 24 causing a regeneration of electrical energy and a transfer of same to the motor 34 via the drive unit 50 and the bus 54 as described above. This cycling will continue until the bowl comes to a complete stop. If, due to this power regeneration, there is danger of

exceeding the amount of power that the DC bus 54 can handle, the SLC 60 will turn on the drive motor 24 through the drive unit 50 with an acceleration ramp to consume the generated power and maintain the power applied to the DC bus 54 within acceptable limits.

Allowable Subject Matter

10. Claims 1-8 are allowable over the prior art of record.

11. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The prior art of record, particularly Phillips '123, does not teach or fairly suggest the claimed control system for a decanter centrifuge including the recited means connected to the common DC bus and a stand for providing lubrication to the centrifuge for controlling the stand or the recited means connected to the common DC bus for providing lubrication to the centrifuge such that the centrifuge bearings are lubricated during the coast down of the centrifuge that occurs during a power failure.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The cited prior art discloses centrifuge control and lubrication systems.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles E. Cooley whose telephone number is (571)

272-1139. The examiner can normally be reached on Mon-Fri. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

14. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Charles E. Cooley
Primary Examiner
Art Unit 1723

14 April 2005